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P1.36: Generation of Millimeter and Sub-millimeter Radiation in a Compact Oscillator Utilizing the Two-Stream Instability

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We propose a novel technique to produce sub-millimeter radiation; this technique mingles two electron beams of slightly different energies. On their own, these beams will exhibit a two-stream instability. Proper initial modulation of the beams can control this instability, allowing such a device to act as an oscillator at chosen radiation frequencies in the millimeter and sub-millimeter ranges. Simulations of this device show amplification of 100-

GHz radiation, with convenient scaling up to 1 THz. Additionally, the experiment merely requires two low-voltage, low-current electron beams and straightforward beam and millimeter-wave optics; with a total beamline length of under a meter. We predict this simple and compact device can generate up to 100 W of 1-THz radiation.